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Report of the technical review of the sixth national communication of Canada

Parties included in Annex I to the Convention are requested, in accordance with decision 9/CP.16, to submit a sixth national communication to the secretariat by 1 January 2014.

This report presents the results of the technical review of the sixth national communication of Canada conducted by an expert review team in accordance with the "Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention".

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Contents

		Paragraphs	*Page*
I.	Introduction and summary	1–10	3
	A. Introduction	1–5	3
	B. Summary	6–10	3
II.	Technical review of the reported information in the national communication	11–131	4
	A. Information on greenhouse gas emissions and national circumstances relevant to greenhouse gas emissions and removals	11–16	4
	B. Policies and measures	17–65	6
	C. Projections and the total effect of policies and measures	66–94	16
	D. Provision of financial resources and technology transfer to developing country Parties	95–110	23
	E. Vulnerability assessment, climate change impacts and adaptation measures	111–118	26
	F. Research and systematic observation	119–126	28
	G. Education, training and public awareness	127–131	29
III.	Conclusions and recommendations	132–140	30
Annex			
	Documents and information used during the review		32

I. Introduction and summary

A. Introduction

1. For Canada, the Convention entered into force on 21 March 1994. Under the Convention, Canada made a commitment to reduce its greenhouse gas (GHG) emissions by 17.0 per cent by 2020 below the 2005 level.

2. This report covers the in-country technical review of the sixth national communication (NC6) of Canada, coordinated by the secretariat, in accordance with the "Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention" (decision 23/CP.19).

3. The review took place from 6 to 11 October 2014 in Ottawa, Canada, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: Ms. Stacy Angel (United States of America), Ms. Helen Plume (New Zealand), Mr. Arthur Rolle (Bahamas) and Mr. Koen Smekens (Belgium). Ms. Plume and Mr. Rolle were the lead reviewers. The review was coordinated by Ms. Ruta Bubniene (secretariat).

4. During the review, the expert review team (ERT) reviewed each section of the NC6.

5. In accordance with decision 23/CP.19, a draft version of this report was communicated to the Government of Canada, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

B. Summary

6. The ERT conducted a technical review of the information reported in the NC6 of Canada in accordance with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications" (hereinafter referred to as the UNFCCC reporting guidelines on NCs).

7. Canada considered some of the recommendations provided in the report of the in-depth review of the fifth national communication (NC5) of Canada to improve its reporting in NC6.[1] The ERT commended Canada for its improved reporting. During the review, Canada provided further relevant information: pertaining to approaches being used to plan for additional policies and measures (PaMs); on how the federal government, provinces and territories coordinate and collaborate on PaMs; on the projected benefits of implemented PaMs; on more details on the projected emissions by sector and by gas for both the 'with measures' and the 'without measures' scenarios; on its reference level approach for forest land remaining forest land (FLRFL); on success stories relating to technology transfer; on its research policies and programmes; and on public access to climate change information.

1. Completeness and transparency of reporting

8. The information reported by Canada in its NC6 is mostly complete and mostly transparent. Gaps and issues related to the reported information identified by the ERT are presented in table 1 below.

[1] FCCC/IDR.5/CAN

2. Timeliness

9. The NC6 was submitted on 20 December 2013, before the deadline of 1 January 2014 mandated by decision 9/CP.16. The NC6 was resubmitted on 2 April 2014 (English and French versions) and on 12 September 2014. The resubmission of 12 September 2014 addressed some errors in the provision and support section and fine-tuning of the classification of the multilateral support.

3. Adherence to the reporting guidelines

10. The information reported by Canada in its NC6 is mostly in adherence to the UNFCCC reporting guidelines on NCs as per decision 4/CP.5 (see table 1). The ERT encourages Canada to improve internal consistency across table 1 and table 5A.8 of the NC6, which summarize PaMs reflected in the projections.

Table 1
Assessment of completeness and transparency issues of reported information in the sixth national communication of Canada[a]

Sections of national communication	*Completeness*	*Transparency*	*Reference to paragraphs*
Executive summary	Complete	Transparent	NA
National circumstances	Complete	Transparent	NA
Greenhouse gas inventory	Complete	Transparent	NA
Policies and measures (PaMs)	Mostly complete	Mostly transparent	19, 58, 63
Projections and total effect of PaMs	Mostly complete	Mostly transparent	70, 93
Vulnerability assessment, climate change impacts and adaptation measures	Complete	Transparent	NA
Financial resources and transfer of technology	Mostly complete	Mostly transparent	108, 109
Research and systematic observation	Complete	Transparent	NA
Education, training and public awareness	Complete	Transparent	NA

Abbreviation: NA = not applicable.

[a] A list of recommendations pertaining to the completeness and transparency issues identified in this table is included in the chapter on conclusions and recommendations.

II. Technical review of the reported information in the national communication

A. Information on greenhouse gas emissions and national circumstances relevant to greenhouse gas emissions and removals

1. Information on relevant national circumstances

11. In its NC6, Canada has provided a detailed description of the national circumstances and elaborated on the framework legislation and key policy documents on climate change. Further information on the review of the institutional and legislative arrangements for the coordination and implementation of PaMs is provided in chapter II.B below.

12. Canada is a federation comprising a central federal government, 10 provincial governments and three territories, with each level being assigned distinct powers under the

constitution. The environment is an area of shared jurisdiction, and respective environmental laws are based on constitutional powers. Federal power resides over international borders, international relations, trade/commerce, navigation/shipping, coasts/fisheries, criminal law and legislation in the national interest. Provincial power resides over municipalities, local works, property and civil rights, and provincially owned lands and natural resources. Territorial governance is based on delegated powers under the authority of the Parliament of Canada, and devolution is ongoing. Every jurisdiction has an environmental ministry or agency; however, responsibilities can be shared within each government.

13. At the federal level, Environment Canada, under the Minister of the Environment, has the lead for domestic and international climate change policies. Several federal departments/agencies have environmental components beyond Environment Canada such as Natural Resources Canada, Transport Canada, Agriculture and Agri-Food Canada and the Canadian Environmental Assessment Agency. Natural resources, including energy, are primarily under provincial jurisdiction. As an example, provinces own resources within their boundaries and manage resource development, royalties and land-use planning. Emissions of GHGs are addressed through legislation at both federal and provincial levels. The government has legislative instruments to address climate change, the primary statute of which is the Canadian Environmental Protection Act of 1999.

14. The ERT noted that during the period 1990–2012, Canada's population and gross domestic product (GDP) increased by 26.0 and 66.9 per cent, respectively, while GHG emissions per GDP and GHG emissions per capita decreased by 28.9 and 6.1 per cent, respectively. Table 2 illustrates the national circumstances of Canada by providing some indicators relevant to GHG emissions and removals.

Table 2
Indicators relevant to greenhouse gas emissions and removals for Canada

	1990	*2000*	*2005*	*2010*	*2011*	*2012*	*Change 1990–2012 (%)*	*Change 2011–2012 (%)*
Population (million)	27.69	30.69	32.25	34.13	34.48	34.88	26.0	1.2
GDP (2005 USD billion using PPP)	773.38	1025.29	1162.38	1238.14	1269.45	1291.14	66.9	1.7
TPES (Mtoe)	208.57	251.50	270.74	251.31	252.99	251.12	20.4	−0.7
GHG emissions without LULUCF (kt CO_2 eq)	590 908.11	721 362.48	735 829.05	699 302.26	701 212.37	698 626.47	18.2	−0.4
GHG emissions with LULUCF (kt CO_2 eq)	519 888.13	669 850.44	789 241.39	775 045.16	778 021.55	739 486.72	42.2	−5.0
GDP per capita (2005 USD thousand using PPP)	27.93	33.41	36.04	36.28	36.82	37.02	32.5	0.5
TPES per capita (toe)	7.53	8.19	8.40	7.36	7.34	7.20	−4.4	−1.9
GHG emissions per capita (t CO_2 eq)	21.34	23.50	22.82	20.49	20.34	20.03	−6.1	−1.5
GHG emissions per GDP unit (kg CO_2 eq per 2005 USD using PPP)	0.76	0.70	0.63	0.56	0.55	0.54	−28.9	−1.8

Sources: (1) GHG emission data: Canada's 2014 GHG inventory submission, version 1.1, submitted 11 April 2014; (2) Population, GDP and TPES data: International Energy Agency.

Notes: (1) The ratios per capita and per GDP unit are calculated relative to GHG emissions without LULUCF; the ratios are calculated using the exact (not rounded) values and may therefore differ from a ratio calculated with the rounded numbers provided in the table. (2) LULUCF emissions include the effect of uncontrollable large forest natural disturbances (wildfires and insect infestations) and, as a result, are highly variable from year to year due to these non-anthropogenic factors.

Abbreviations: GDP = gross domestic product, GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, PPP = purchasing power parity, TPES = total primary energy supply.

2. Information on the greenhouse gas inventory, emissions and trends

15. Canada has provided a summary of information on GHG emission trends for the period 1990–2011. This information is fully consistent with the 2013 national GHG inventory submission. Summary tables, including trend tables for emissions in carbon dioxide equivalent (CO_2 eq) (given in the common reporting format tables), are provided in an annex to the inventory section of the NC6. During the review, the ERT took note of the 2014 annual submission. The relevant information therein is reflected in this report. Comparing the 2014 submission with the 2013 submission, on which the NC6 is based, the changes observed for the overlapping years are insignificant, of the order of tenths of a per cent regarding the total without land use, land-use change and forestry (LULUCF) emissions and due to recalculations made in the industrial processes, agriculture and waste sectors in the 2014 submission.

16. Total GHG emissions[2] excluding emissions and removals from LULUCF increased by 18.2 per cent between 1990 and 2012, whereas total GHG emissions including net emissions or removals from LULUCF increased by 42.2 per cent over the same period. The large change when LULUCF is included reflects the fact that uncontrollable large forest natural disturbances (wildfires and insect infestations) have converted the sector to being a large source in most years since 2002, whereas in 1990, LULUCF was a sink because of relatively low natural disturbances. GHG emissions increased by 18.2 per cent over this period, driven by an increase in CO_2 (19.9 per cent increase), methane (CH_4) (25.8 per cent increase) and hydrofluorocarbon (HFC) (914.4 per cent) emissions. These increasing emissions are partially offset by decreasing emissions from nitrous oxide (N_2O) (2.9 per cent), perfluorocarbons (PFCs) (76.3 per cent) and sulphur hexafluoride (SF_6) (86.8 per cent) over the same period. An analysis of the drivers of GHG emission trends in each sector is provided in chapter II.B below. Table 3 provides an overview of GHG emissions by sector from 1990 to 2012.

B. Policies and measures

17. Canada has provided in its NC6 comprehensive information on its package of PaMs implemented, adopted and planned in order to fulfil its commitments under the Convention.

1. Policies and measures related to implementation of commitments under the Convention

18. In its NC6, Canada reported on its PaMs adopted, implemented and planned in achieving its commitments under the Convention. Canada provided information on PaMs by sector and a description of the principal PaMs. Canada has also provided information on how it believes its PaMs are modifying longer-term trends in anthropogenic GHG emissions and removals in accordance with the objective of the Convention. The NC6 contains, with a few exceptions, a set of PaMs that is similar to those in the NC5.

[2] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of CO_2 eq excluding LULUCF, unless otherwise specified.

Table 3
Greenhouse gas emissions by sector in Canada, 1990–2012

	GHG emissions (kt CO_2 eq)					*Change (%)*		*Share[a] by sector (%)*	
Sector	*1990*	*2000*	*2010*	*2011*	*2012*	*1990–2012*	*2011–2012*	*1990*	*2012*
1. Energy	469 183.81	590 781.93	569 551.01	572 926.44	565 758.87	20.6	–1.3	79.4	81.0
A1. Energy industries	144 449.61	197 961.50	163 746.08	156 064.38	151 742.07	5.0	–2.8	24.4	21.7
A2. Manufacturing industries and construction	64 275.54	68 903.29	77 298.32	81 970.23	85 416.75	32.9	4.2	10.9	12.2
A3. Transport	146 345.41	180 182.41	197 774.69	197 479.35	195 111.70	33.3	–1.2	24.8	27.9
A4–A5. Other	71 749.62	80 692.84	72 271.27	77 821.07	72 381.63	0.9	–7.0	12.1	10.4
B. Fugitive emissions	42 363.63	63 041.89	58 460.65	59 591.41	61 106.72	44.2	2.5	7.2	8.7
2. Industrial processes	55 705.87	53 792.11	54 091.65	54 652.51	56 457.08	1.3	3.3	9.4	8.1
3. Solvent and other product use	178.71	449.60	241.97	247.40	310.14	73.5	25.4	0.0	0.0
4. Agriculture	46 832.28	55 745.78	55 085.32	53 035.84	55 528.60	18.6	4.7	7.9	7.9
5. LULUCF	–71 019.98	–51 512.04	75 742.90	76 809.17	40 860.25	–157.5	–46.8	NA	NA
6. Waste	19 007.45	20 593.06	20 332.32	20 350.18	20 571.78	8.2	1.1	3.2	2.9
GHG total with LULUCF	**519 888.13**	**669 850.44**	**775 045.16**	**778 021.55**	**739 486.72**	**42.2**	**–5.0**	**NA**	**NA**
GHG total without LULUCF	**590 908.11**	**721 362.48**	**699 302.26**	**701 212.37**	**698 626.47**	**18.2**	**–0.4**	**100.0**	**100.0**

Source: Canada's 2014 GHG inventory submission, version 1.1, submitted 11 April 2014 (for GHG emission data).

Notes: (1) The changes in emissions and the share by sector are calculated using the exact (not rounded) values and may therefore differ from values calculated with the rounded numbers provided in the table; (2) LULUCF emissions include the effect of uncontrollable large forest natural disturbances (wildfires and insect infestations) and, as a result, are highly variable from year to year due to these non-anthropogenic factors.

Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, NA = not applicable.

[a] The shares of sectors are calculated relative to GHG emissions without LULUCF; for the LULUCF sector, the negative values indicate the share of GHG emissions that was offset by GHG removals through LULUCF.

19. The NC6 does not include some information required by the UNFCCC reporting guidelines on NCs, including textual descriptions of the principal federal PaMs for the waste or agriculture sectors. The ERT recommends, if applicable, that Canada provide textual descriptions of the principal federal PaMs in the agriculture and the waste sector in its next national communication (NC).

20. Detailed information on PaMs as required in table 1 of the UNFCCC reporting guidelines on NCs, such as mitigation estimates for historic years, is not provided. Substantive relevant information is provided in common tabular format (CTF) table 3 of the first biennial report (BR1) without reference to it in NC6. The ERT recommends that Canada improve its transparency of reporting by providing a clear reference to CTF table 3 as a replacement for table 1 of the UNFCCC reporting guidelines on NCs and by providing mitigation estimates for historic years.

21. The ERT noted that Canada in its NC6, similar to its NC5, continued to report provincial PaMs by province, not by sector as required by the UNFCCC reporting

guidelines on NCs. The ERT recommends that Canada structure textual descriptions of PaMs by sector.

22. PaMs are presented on a sectoral basis defined by the Party based on economic structures. This is different to the Intergovernmental Panel on Climate Change (IPCC) classification, but is broadly in line with UNFCCC reporting guidelines on NCs. The following sectors are distinguished: electricity, oil and gas, transport, buildings, emission-intensive and trade-exposed industries, agriculture, and waste and others. The sectoral classification used for the PaMs is using the same sectoral categories as in the projections section of the NC6. The ERT recognizes the rationale for reporting sectors as being to reflect the country's sector-by-sector regulatory approach to reducing GHG emissions. However, the ERT encourages Canada to provide a crosswalk with the UNFCCC classification of the GHG inventory sectors for increased transparency in its next NC.

23. Canada did not report, within the NC6, on PaMs that are no longer in place, but did provide such information during the review, as requested by the ERT. PaMs no longer in place include ecoTRANSPORT, ecoENERGY programmes for transport fleets, which have been superseded by the ecoENERGY Efficiency for Vehicles programme, as well as ecoENERGY for Renewable Heat, ecoENERGY Retrofit Initiative, ecoTRANSPORT-ecoFREIGHT and ecoMOBILITY programmes, which have been retired. The ERT encourages Canada to provide information on PaMs no longer in place in its next NC, along with discussions on why the PaMs are no longer in place.

24. The NC6 did provide some information on the cost and benefits of reported PaMs. For example, Canada reported on its progress with the implementation of a Group of 20 (G20) commitment to rationalize and phase out inefficient fossil fuel subsidies, with this phase-out estimated to reduce tax expenditures by Canadian dollars (CAD) 500 million from 2011 to 2018.

25. Some of the recommendations from the previous review were taken into consideration to improve reporting in the NC6, including providing information on actions that Canada is taking to update existing PaMs, which may lead to greater levels of anthropogenic GHG emissions than would otherwise occur. During the review, Canada provided additional information, elaborating on approaches being used to plan for additional PaMs, how the federal government, provinces and territories coordinate and collaborate, and projected benefits of implemented PaMs. During the review, Canada provided the report of the Commissioner of the Environment and Sustainable Development on the federal government's progress on climate change mitigation.[3]

2. Policy framework and cross-sectoral measures

26. Within the Government of Canada, Environment Canada, under the Minister of the Environment, is the lead authority for federal and international climate change policies. The Canadian Environmental Protection Act of 1999 provides the legal authority for Environment Canada to regulate GHG emissions as a toxic substance. Under the act, the Minister of the Environment may establish regulation on various aspects related to the release of GHGs, including setting quantities or concentrations of GHGs that may be released from various types of facilities, or from vehicles, engines and equipment manufactured or imported into Canada for the purpose of sale. This is the key legal authority that Canada is using to advance its sector-by-sector regulatory approach.

27. In addition to Environment Canada, Natural Resources Canada, Transport Canada and other federal departments also have authorities that may be used to develop and

[3] Office of the Auditor General of Canada. 2014. *Fall Report of the Commissioner of the Environment and Sustainable Development*. 2014. Chapter 1, Mitigating Climate Change. Ottawa.

implement climate change PaMs. Key federal legislative instruments include the Energy Efficiency Act of 1992, the Canadian Shipping Act of 2001, Canadian Fisheries Act, Canadian Forestry Act, Aeronautics Act and the Railway Safety Act. Some of these authorities have been used to set minimum energy efficiency standards and address practices that lead to GHG emissions in the transport sector.

28. Canada's climate change policy portfolio is predominantly composed of regulatory PaMs that address individual economic sectors. These are complemented by economic instruments at the federal level (e.g. the Sustainable Development Technology Fund) and by economic instruments, regulations and a market-based mechanism at the provincial level. The key climate and energy policy at the federal level is based on a sector-by-sector regulatory approach. This approach reflects shifting the focus from the federal cross-sectoral approach that was reported in the NC5. The key drivers of the change in the approach are domestic economic circumstances and policy developments in the United States of America, which is Canada's largest trading partner.

29. Canada's current sector-by-sector regulatory approach has, to date, targeted the transport and electricity sectors, which are two of the highest emitting sectors in Canada. For the transport sector, federal regulations on light- and heavy-duty vehicles have been adopted and are being implemented to reduce emissions by an estimated 18,000 kt CO_2 eq, with an announcement in September 2014 to advance a second phase of the heavy-vehicle regulation to achieve additional mitigation from the transport sector. The federal government has finalized regulations on coal-fired power plants to reduce emissions by an additional 3,000 kt CO_2 eq from the electricity sector in addition to the two existing provincial regulations, which are estimated to reduce emissions by a combined total of 35,000 kt CO_2 eq by 2020. The federal government is also planning regulations in the oil and gas, aviation and other emission-intensive and trade-exposed industries sectors (e.g. aluminium).

30. Several federal monitoring and reporting mechanisms are also in place. The Government of Canada's 2013–2016 Federal Sustainability Development Strategy provides an overarching framework for federal actions to achieve environmental sustainability, which is essential for meeting Canada's economy-wide GHG emission reduction target. Meeting the target is also supported by the federal strategic environmental assessment process, which requires federal departments and agencies to consider the environmental impacts, including GHG emissions, of their proposed policies, plans and programmes.

31. Progress towards meeting the 2020 target is also monitored and reported using data from Canada's national inventory report, which is, in part, based on data from the Facility GHG Reporting Program. Canada also publishes an annual Emissions Trends Report that includes GHG projections to 2020. The modelling of projections is consistent between Canada's domestic reporting and the UNFCCC reporting requirements. The Emissions Trends Report publicly shares, on a more frequent annual basis, how the efforts of the federal, provincial and territorial governments, consumers and businesses are affecting GHG emissions. In addition, Canada includes progress towards meeting its 2020 target as 1 of the 30 environmental indicators reported on in the federal sustainability development strategy progress report.

32. Reporting on progress towards Canada's target includes federal, provincial and territorial PaMs, as reported in table 3 of the common tabular format (CTF). As a rough approximation, reported PaMs at the provincial and territorial levels account for well over half of the estimated 2020 GHG mitigation reported in CTF table 3, with approximately half of the estimated reductions (31,600 kt CO_2 eq) from provincial and territorial PaMs attributable to a single provincial regulation: the Ontario coal phase-out. This confirms the critical role that provincial and territorial jurisdiction and actions are playing to help achieve Canada's GHG mitigation target.

33. Analysis of information reported in CTF table 3 shows that a large number of provincial and territorial PaMs are adopted, implemented and planned (66 of the 90 PaMs in CTF table 3). Canada does not report a mitigation estimate for all of these PaMs. Also of note is that the effect of only 15 out of 66 provincial and territorial PaMs has been estimated. For those PaMs that do report mitigation estimates, the magnitude of these effects suggests that provincial and territorial PaMs may account for more than a half of the total mitigation effect from PaMs in 2020.

34. As the federal government plans new sector-by-sector GHG regulations, the federal government is coordinating and collaborating with provinces and territories to share information on GHG emissions, confirm assumptions and approaches to projections, and better understand local conditions. This coordination at federal–provincial/territorial level is most relevant in relation to regulating sectors with the highest emissions, such as electricity and transport. Less cohesion, however, appears to exist across the provinces and territories concerning their regulatory and economic PaMs, as well as between federal and provincial/territorial informational and fiscal PaMs. The ERT commends the federal government for its coordination with provinces and territories in advancing Canada's sector-by-sector regulatory approach. The ERT encourages Canada to improve its reporting on the role of national, provincial, territorial, regional and local government and the involvement of any other entities on informational and fiscal PaMs.

35. Canada provided comprehensive textual information on PaMs in most sectors at the national and subnational levels. Table 4 provides a summary of the reported information on the PaMs of Canada.

Table 4
Summary of information on policies and measures reported by Canada

Sectors affected	*List of key policies and measures*	*Estimate of mitigation impact (kt CO_2 eq)*
Policy framework and cross sectoral measures		
	Canadian Environmental Protection Act 1999[a]	NE
	Energy Efficiency Act 1992	NE
	Canadian Shipping Act 2001	NE
	Aeronautics Act	NE
	Railway Safety Act	NE
	Government of Canada's 2013–2016 federal sustainability development strategy	NE
	Sustainable Development Technology Canada – Sustainable Development Tech Fund	NE
	British Columbia carbon tax	3 000
	Quebec's cap-and-trade system	NE
Energy		
Cross-cutting energy		
	Clean energy fund	2 800
Energy supply		
	CO_2 emissions from coal-fired generation regulations	3 000
	Ontario coal phase-out	31 600
	Nova Scotia GHG emissions regulations	2 500

Sectors affected	*List of key policies and measures*	*Estimate of mitigation impact (kt CO_2 eq)*
Renewable energy		
	ecoENERGY for Renewable Power Program	6 240
	Newfoundland and Labrador's Muskrat Falls hydroelectric project	1 200
Energy efficiency		
	ecoENERGY efficiency	6 500
	Energy efficiency programmes at the provincial level	4 500
Transport		
	Light-duty vehicle GHG regulations: phases 1 and 2	13 000
	Heavy-duty vehicle GHG regulations	3 000
	Federal renewable fuel regulations	2 000
	CO_2 standards for aviation	NE
Industries		
	Emission-intensive and trade-exposed industries sector regulations	NE
	Oil and gas sector GHG regulations	NE
	Alberta industrial regulations	10 000
	Alberta Carbon Capture and Storage Funding Act	2 800
	Pulp and Paper Green Transformation Program	1 360
Agriculture		
	Growing Forward 2 funding and environmental plans	NE
	Provincial regulatory and fiscal policies and measures	NE
Forestry		
	National Forest Sinks Committee policy strategy research	NE
Waste management		
	Landfill gas regulations in three provinces	2 195

Abbreviations: GHG = greenhouse gas, NE = not estimated.

[a] Provides legislative authority to regulate GHGs.

3. Policies and measures in the energy sector

36. Between 1990 and 2012, GHG emissions from the energy sector increased by 28.2 per cent (111,000 kt CO_2 eq), mainly owing to a substantial 71.3 per cent increase (72,000 kt CO_2 eq) in oil and gas sector emissions, that was partly offset by a decrease in electricity sector emissions (8,000 kt CO_2 eq). These sectors accounted for 24.7 per cent and 12.3 per cent of the total emissions in 2012, respectively. The trend in transport sector GHG emissions, which accounts for 23.6 per cent of the total emissions, has been relatively flat in recent years, although 37,000 kt CO_2 eq (28.9 per cent) more emissions were produced in 2012 compared to the 1990 level. Emissions from energy use in buildings also increased by 10,000 kt CO_2 eq (14.3 per cent) from 1990 to 2012, with emissions decreasing in recent years.

37. ***Transport sector.*** The transport sector accounts for 23.7 per cent (165,000 kt CO_2 eq) of total 2012 GHG emissions. Primarily driven by the country's geography and large territory, approximately 40 per cent of transport sector GHG emissions in 2012 were

attributable to on-road freight, rail, air and marine transportation. Canada is advancing a regulatory approach for this sector through light- and heavy-duty vehicle GHG regulations and federal renewable fuel regulations, which contribute a combined 18,000 kt CO_2 eq to the 2020 target. In addition to limiting exhaust GHG emissions, the federal regulatory approach also supports alternative energy sources for use by the transport sector, including renewable fuel, natural gas and electric powered vehicles. For example, electric powered vehicles are incentivized within the federal light-duty vehicle rules, given the declining emission intensities for electricity in Canada.

38. In the transportation sector, the federal government collaborates with partners to develop and implement regulatory regimes. For example, the federal government has worked with the International Civil Aviation Organization to develop regulations. The government has also partnered with the International Maritime Organization to implement regulations. Additional complementary PaMs to support the uptake of clean transportation technologies and practices are also being advanced through voluntary agreements with industry, providing economic incentives for deployment, and conducting research on new technologies. For example, Canada released its action plan to reduce GHG emissions from aviation in 2012 and is advancing work under the Regulatory Cooperation Council Locomotive Emissions Initiative with the United States and industry in Canada and the United States. The ecoENERGY Efficiency Program also includes working with road freight transportation companies to reduce GHG emissions.

39. Estimates of emission reductions in 2020 were not provided for several PaMs in the transport sector. The ERT encourages Canada to provide, whenever possible, a quantitative estimate of the impacts of the voluntary agreements for the benefit of evaluating the success of implementation and to better understand potential regulatory options and opportunities.

40. ***Oil and gas sector***. The oil and gas sector's contribution to total GHG emissions has grown from 21.6 per cent (159,000 kt CO_2 eq) in 2005 to 24.7 per cent (173,000 kt CO_2 eq) in 2012. The sector's emissions are projected to grow by 15.6 per cent without additional mitigation PaMs, which are also projected to increase the sector's contribution to overall emissions to 26.2 per cent (200,000 kt CO_2 eq) in 2020. The federal government is planning regulations for this sector, but neither the approach nor the quantitative estimates of the mitigation potential were available at the time of the review. The ERT encourages Canada to report, as appropriate, a quantitative estimate of the impacts of the planned PaMs in this sector in its next NC.

41. Consistent with Canada's G20 commitment, the federal government is removing conflicting policies by phasing out fossil fuel subsidies. These measures are projected to reduce tax expenditures by CAD 500 million by 2018, affecting oil, gas and coal.

42. ***Electricity***. The electricity sector accounts for 12.3 per cent (86,000 kt CO_2 eq) of the total 2012 GHG emissions. Emissions for this sector have decreased significantly (28.9 per cent) since the 2005 level of 121,000 kt CO_2 eq, with declines projected to continue with the additional retirements of coal-fired power plants. As of 2012, coal-fired energy generation supplied 9.6 per cent of Canada's 616 TWh of annual electricity generation. Hydroelectric energy generation accounts for 61.2 per cent of the total generation, with nuclear energy generating 14.5 per cent, other fossil fuels generating 11.5 per cent and non-hydroelectric renewable energies generating 3.3 per cent. This generation mix varies greatly across the provinces and territories, with the majority of coal-fired energy generation being in Alberta, Saskatchewan and Nova Scotia. The two provinces with the largest total generation of renewable energy sources are Quebec and British Columbia (primarily hydroelectric energy). Canada also exports about 10 per cent of its electricity generation to the United States, with net exports growing since 2010.

43. New federal regulations of CO_2 emissions from coal-fired generation are to address additional mitigation in the sector. Such regulations can build on actions already being taken by provinces, adjusted to reflect national considerations. Equivalency agreements are considered where regulation at the provincial and territorial levels is deemed to have an equivalent or better mitigation effect and provided they meet the requirements as outlined by the Canadian Environmental Protection Act of 1999. Canada reported its approach to take advantage of end-of-life stock turnover of coal-fired power plants. Given the timing of plant retirements, the projected annual mitigation of 3,000 kt CO_2 eq in 2020 is small compared to the longer-term benefits of these regulations. Canada estimates that annual mitigation benefits will total 25,000 kt CO_2 eq in 2030.

44. Electricity generation from renewable resources is also supported at the federal and provincial levels. For example, the ecoENERGY for Renewable Power Program continues to make payments to the renewable energy units built before 31 March 2011. This economic programme is estimated to reduce emissions by 6,000 kt CO_2 eq in 2020, providing CAD 1.4 billion from 2007 to 2021 for qualifying low-impact renewable energy projects larger than 1 MW in size, such as wind turbine plants. Ontario is also supporting renewable energy generation through a feed-in tariff programme that allows for the sale of renewable energy, such as solar, wind, water, biomass, biogas and landfill gas, into the electricity grid at set rates. As of May 2013, about 1,700 small and large projects had been approved, representing over 4,500 MW of capacity. Newfoundland and Labrador's Muskrat Falls hydroelectric project will displace the use of oil-fired electricity generation, which represents over 10 per cent of the province's GHG emissions. This project is predicted to result in approximately 1,200 kt CO_2 eq of GHG reductions.

45. ***Buildings***. The buildings sector accounts for 11.4 per cent (80,000 kt CO_2 eq) of the total 2012 GHG emissions. Between 2005 and 2012, emissions from buildings decreased by 4.8 per cent (4,000 kt CO_2 eq). Energy efficiency improvements implemented through ecoENERGY efficiency and energy efficiency programmes at the provincial level contributed to this decline. Based on information provided during the review, Canada estimates that without energy efficiency improvements, energy use would have grown by approximately 50 per cent from 1990 to 2011, a time period during which GDP increased by approximately 65 per cent. The actual energy use growth in this sector only grew by approximately a quarter during this time frame, demonstrating a decoupling of economic growth and energy consumption.

46. Canada continues to implement the Energy Efficiency Act of 1992, with energy efficiency standards for over 40 products, including major appliances. Emission reductions from these regulatory measures are included within the 6,500 kt CO_2 eq reported for the cross-cutting ecoENERGY Efficiency Program in 2020. However, this estimate only reflects those standards put in place since Canada's NC5. This figure does not include the estimated mitigation impact of 44,800 kt CO_2 eq in 2020 resulting from energy efficiency standards published prior to 2011. Compliance with energy efficiency standards is supported by regular reporting and important documentation of products. Natural Resources Canada is required to submit annual reports to parliament on the implementation of the Energy Efficiency Act of 1992.

47. In addition to appliance standards, Canadian federal government engages with the ENERGY STAR Program of the United States to support use of the brand and related tools in the Canadian market. For example, Natural Resources Canada recently worked with the Environmental Protection Agency to offer the ENERGY STAR Portfolio Manager building energy use benchmarking tool to Canadian buildings. The tool has been adapted to include Canadian weather, postal codes, both official languages, the metric system and data specific to Canada. Canada also helps to support delivery of ENERGY STAR new homes and non-

federal energy efficiency programmes that provide rebates for the purchase of ENERGY STAR products in the Canadian market.

48. The ecoENERGY Efficiency Program also supports model energy codes to mandate lower energy consumption by buildings. Given the mix of federal, provincial and territorial authorities in this space, the Canadian federal government action has included establishing a model energy code for buildings. Provinces and territories can then take action to adopt and enforce codes. To date, all provinces and two territories have agreed to adapt the 2011 model code for buildings. The Ontario building code is estimated to reduce emissions by 2,900 kt CO_2 eq by 2020.

49. During the review, the ERT learned that the ecoENERGY Efficiency Program made a shift in this approach for the 2011–2016 programme cycle, reflecting a transition away from direct financial incentive payments for energy efficiency buildings. The information and education elements of the ecoENERGY Efficiency Program continue, including coordination with the United States in order to deliver the ENERGY STAR brand and programme tools to the Canadian market. Natural Resources Canada efforts with building energy efficiency include working with utilities to support delivery of energy efficiency incentive programmes to customers, although federal funds are no longer allotted to provide direct incentive payments. The ERT commends Canada for its continued engagement and support at the federal level to increase energy efficiency in buildings and encourages Canada to increase transparency on changes to PaMs in its next NC.

50. The NC6 also reports additional energy efficiency PaMs in the building sector at the provincial level. In addition to the Ontario building code mentioned in paragraph 48 above, two provincial PaMs estimate GHG mitigation for 2020. The Efficiency Nova Scotia Corporation Act (1,300 kt CO_2 eq in 2020) created an independent programme administrator called the Efficiency Nova Scotia Corporation to deliver electricity efficiency programmes funded in part by a levy on the Nova Scotia electricity users. The New Brunswick energy efficiency regulation (0,300 kt CO_2 eq in 2020) also established Efficiency New Brunswick in 2005 to delivery energy efficiency programmes to residential and commercial sectors.

51. The federal ecoENERGY Efficiency Program shared information on how its efforts are coordinated with efforts by non-governmental organizations. The ERT encourages Canada to report in its next NC on the role of national, provincial, territorial, regional and local governments and the involvement of any other entities with regard to PaMs in the building sector.

4. Policies and measures in other sectors

52. Although emissions from the agriculture sector increased by 27.8 per cent (15,000 kt CO_2 eq), emission-intensive and trade-exposed industries decreased their emissions by 17.9 per cent (17,000 kt CO_2 eq) between 1990 and 2012. Overall, GHG emissions from the industrial processes (reflected by Canada as the emission-intensive and trade-exposed industries), agriculture, and waste decreased by 1.5 per cent (3,000 kt CO_2 eq) over this time frame. Note that, given Canada's sectors, there is some overlap in this section with combustion of fossil fuels for energy in the emission-intensive and trade-exposed industries.

53. ***Emission-intensive and trade-exposed industries***. The emission-intensive and trade-exposed industries (including fertilizers and chemicals, aluminium, iron and steel, pulp and paper, cement, base metal smelting, iron ore pelletizing and lime) sector accounts for 11.2 per cent (78,000 kt CO_2 eq) of the total 2012 GHG emissions. Emissions from this sector have declined by 17.9 per cent (17,000 kt CO_2 eq) from 1990 to 2012, with a 12.4 per cent (11,000 kt CO_2 eq) decline since 2005. This decline is, in part, due to the

overall economic downturn, which has reduced demand for products from industries such as pulp and paper.

54. Canada is in the process of developing performance standards for the nine emission-intensive and trade-exposed sectors, with the intention to have new regulations in place prior to 2020. As part of this process, Canada has undergone detailed data collection at the facility level and is working collaboratively with stakeholders and provinces.

55. Emission reductions from addressing combustion (primarily for energy/heat) are identified as a key opportunity for most of these sectors, as well as addressing process-related GHGs in the aluminium sector. The ERT encourages Canada to report on its planned PaMs in its next NC.

56. ***Agriculture***. The agriculture sector accounts for 9.9 per cent (69,000 kt CO_2 eq) of total 2012 GHG emissions. Between 1990 and 2012, GHG emissions from the agriculture sector increased by 27.8 per cent (15,000 kt CO_2 eq). However, GHG emissions from the agriculture sector have been relatively stable in recent years and have shown some decoupling from production, with a growth in sectoral emissions of only 1.5 per cent (1,000 kt CO_2 eq) since 2005.

57. Provinces and territories have unique authorities in the agriculture sector, which can be used to encourage and support GHG mitigation outside of federal PaMs. The federal level co-funds the Growing Forward 2 Program, which includes a 60/40 federal/provincial and territorial cost-share split to support on-farm actions, using environmental farm plans to provide information on the use of funds and to mitigate identified risks. These environmental farm plans are developed consistently with federal policy direction and reflect local conditions.

58. PaMs in the agriculture sector are not explicitly listed in the NC6 nor reflected in the projections to 2020. However, the ERT did receive information on the agriculture sector PaMs during the review, including the Environmental Stewardship Incentive Program, the Agricultural Greenhouse Gases Program and the AgriInnovation Program, among other activities. The ERT recommends that Canada improve transparency of reporting and provide textual descriptions of the principal PaMs in the agriculture sector in its next NC.

59. ***LULUCF***. The LULUCF sector was responsible for a net removal of 76,809 kt CO_2 eq in Canada in 2011, mainly reflecting high and uncontrollable forest natural disturbances (wildfires and insect infestations) rates. Forest conversion rates have remained low due to decreases in activities in agriculture and hydroelectricity. Such decreases in forest conversions activities are enough to offset new forest conversions that are taking place for the oil and gas sectors. The sector is primarily under the jurisdiction of the provincial and territorial governments.

60. The National Forest Sinks Committee, a federal/provincial/territorial technical policy group, is conducting scoping studies and research, and reporting on strategies to reduce GHG emissions related to forest management. The effort is identifying strategies such as growth/regrowth, residue management, decreasing harvesting and the use of bioenergy. The life cycle GHG impacts of strategies are being assessed to compare and prioritize strategies.

61. Individual PaMs in the LULUCF sector are not highlighted in the sectoral textual description in the NC6 nor reflected in the projections to 2020. The ERT encourages Canada to improve textual descriptions of the principal PaMs in the LULUCF sector in its next NC, including mentioning which provinces have PaMs in this sector, and what actions are being taken at the federal level to plan for new PaMs and to support provinces and territories.

62. ***Waste management***. The waste and others sectors accounts for 6.7 per cent (47,000 kt CO_2 eq) of total 2012 GHG emissions. Between 1990 and 2012, GHG emissions from the waste sector decreased by 2.1 per cent (1,000 kt CO_2 eq), mainly driven by conversion of landfill gas to electricity and diversion of organic waste away from landfills. The opportunity remains for more landfill gas to be used for electricity over the next 10 years, even with organic diversions.

63. The NC6 provided limited information on waste sector PaMs, which was supplemented during the review. The ERT recommends that Canada improve transparency of reporting and include elaborated textual descriptions of PaMs in the waste sector in its next NC.

64. Environment Canada helps with technical assistance for diverting organics, including the 2013 Technical Document on Municipal Solid Waste Organics Processing. There are also federal funding programmes for waste management projects that promote recycling, organics processing and landfill gas capture.

65. Three provinces with PaMs to capture landfill gas are estimated to contribute over 2,000 kt CO_2 eq reductions in 2020: Alberta and British Columbia have offset systems that also apply to landfill gas, and Ontario's feed-in tariff PaM is used by some landfills for generating electricity.

C. Projections and the total effect of policies and measures

1. Projections overview, methodology and key assumptions

66. The GHG emission projections provided by Canada in its NC6 include a 'with measures' and a 'without measures' scenario until 2030 and 2020, respectively, presented relative to actual inventory data for 1990–2011.

67. Projections are presented on a sectoral basis defined by the Party based on economic structures, which is different to the IPCC classification, but which is in line with the UNFCCC reporting guidelines on NCs. The following sectors are distinguished: electricity, oil and gas, transport, buildings, emission-intensive and trade-exposed industries, agriculture, and waste and others. The sectoral classification used for the projections uses the same sectoral categories as in the PaMs section of the NC6. Projections are also presented on a gas-by-gas basis for the following GHGs: CO_2, CH_4, N_2O, PFCs, HFCs and SF_6. Projections are provided in an aggregated format for each sector, as well as for a national total, using the IPCC Second Assessment Report global warming potential values. Emission projections related to fuel sold to ships and aircraft engaged in international transport were reported separately and not included in the totals.

68. During the review, the Party provided more details on the projected emissions by sector and by gas for both the 'with measures' and the 'without measures' scenarios. This additional information was consistent with the original information provided in the NC6.

69. The Party applied the following definition for the 'with measures' scenario: it includes all federal and provincial PaMs adopted up to May 2013. The 'without measures' scenario excludes measures taken after 2005. Some technical, non-policy driven events are included in both scenarios; this relates, in particular, to changes in the electricity generation sector, including refurbishment of nuclear power plants and weather-related hydroelectric output. Canada did not provide a 'with additional measures' scenario because planned regulations are still under development at both federal and provincial levels. The ERT encourages Canada to explore means to include a 'with additional measures' scenario, even if the effects of planned measures are not yet finalized. The use of possible ranges of such effects could be supportive to such a scenario.

70. Although the NC6 lists the PaMs included in the 'with measures' scenario, the ERT noted some inconsistencies with the PaMs section: some policies were listed under a different name, others occurred in the PaMs list as being modelled, but were not included in the scenario list, and others were on the scenario list, but were not included in the PaMs list. The ERT recommends that Canada provide information on the implemented and adopted measures included in the 'with measures' projections, improve the consistency and transparency between the PaMs included in the PaMs section of the NC6 and those listed as being included in the projections scenarios reported in the projections section of the NC6.

71. The measures included in the 'with measures' scenario cover mainly the energy supply and the transport, waste and buildings sectors, and are distributed over the federal and provincial levels. During the review, the ERT was informed that there are also PaMs adopted in other sectors (e.g. in the agriculture sector with environmental farming plans), or are envisaged (e.g. in the LULUCF sector). The ERT recommends that Canada include in its 'with measures' projections scenario all currently implemented and adopted measures.

72. Although the NC6 is transparent on the measures listed, the ERT noted that it is not clear how the measures taken at the federal and provincial authority levels are reflected in the modelling of the scenarios. During the review, the ERT was informed that the modelling tool has provincial disaggregation and that provincial policies are modelled after consultation with the provinces concerned, so that the outcome of the federal model reflects the assumptions made by provinces of the effect of the measure to the extent possible. The ERT recommends that Canada to describe more transparently in its next submission the modelling methodology of both federal and provincial measures.

73. The types of measures range from performance standards (including for light- and heavy-duty vehicles, coal-fired power plants, commercial and residential buildings, and appliances) to carbon taxes, tax exemptions and feed-in tariffs for renewables and biofuels. Although Canada is not using approved international market mechanisms, the province of Quebec has developed its own cap-and-trade system with the state of California in the United States. In the NC6 and also during the review, Canada could not provide more specific information on how the effect of this measure will be accounted for in the national target as the Government of Canada has not counted any international purchases towards its target, accounting for only emissions in Canada. The ERT encourages Canada to report more transparently on its intended use of such provincial initiatives towards its national target and on the effects thereof in case such initiatives involve international market-based mechanisms.

74. As for the NC5, Canada used its E3MC[4] modelling tool for projections in the NC6. This simulation model consists of two modules: an energy module, Energy2020, and a macroeconomic module. Energy2020 covers both energy supply and demand. It has been developed by, and intellectual property rights lie with, a consultant. Since contracts for the use of the model have been put in place, Environment Canada has carried out considerable efforts to build in-house modelling capacity and now relies on the consultant primarily for technical support. For this reason, Canada reported that it was unlikely that this arrangement could pose risks for disruption in modelling knowledge and capacity.

75. The Energy 2020 module also covers the United States energy system, enabling it to include the closely linked energy markets in North America endogenously in the Canadian analysis and scenarios. Cross-border trade of electricity is based on commodity price differences and interconnection capacity between both countries. Other trade-affected fuels (e.g. gas, oil and coal) use world market prices to determine import and export amounts.

[4] Energy, Emissions and Economy Model for Canada.

76. The macroeconomic model was developed by a consultant and is now managed by Environment Canada. The E3MC model and its modules are briefly described in the NC6, but additional information, references to peer reviews and further information are provided in annexes. During the review, Canada informed the ERT that it strives to strengthen its model quality and its modelling capacity by, among other activities, participating in the international Energy Modelling Forum, which is led by Stanford University in the United States.

77. The E3MC model has provincial spatial disaggregation, enabling it to include provincial measures. Existing electricity generation plants, including fossil fuel, nuclear energy and renewable energy plants, are individually included. The main means to include measures in the energy subsectors is to make changes to the technology energy intensities of the subsector concerned. The ERT was informed during the review that the E3MC model serves as an integrating tool for projections in the non-energy sectors, in particular, agriculture, but also for transport. For these sectors, the outputs of sectoral models, managed by different governmental departments, are taken as input into the E3MC model, which then balances total demand and supply. The ERT encourages Canada to report more transparently on the structure and use of the different modules and sectoral inputs of its E3MC model.

78. For the LULUCF sector, given its vast presence and potential impact on Canada's emissions, Canada has developed a set of dedicated models, managed by different governmental departments, for GHG inventory and projection purposes for the following categories: forest land converted to other land categories, FLRFL and land converted to forest land and cropland remaining cropland, which are described in the NC6. In response to a question raised by the ERT during the review on consistency between these models, Canada replied that the tools developed by the three governmental departments are integrated in such a way that the different modelling frameworks for the various land categories can exchange information on land that is converted from one category to another, using consistent spatial referencing. For this purpose, a hierarchical spatial framework was agreed upon by all data partners and is used to ensure the highest possible consistency and spatial integrity of the LULUCF GHG inventory and projections. For all but FLRFL, projection emissions and removals are reported using these tools.

79. For determining the accounting contribution for FLRFL, Canada applies the reference level approach, which is different to the accounting approach used for other LULUCF subsectors. The reference level approach was approved in decision 2/CMP.7 for accounting for forest management under Article 3, paragraph 4, of the Kyoto Protocol. Canada's reference level approach covers the years 2010–2020, in conformance with the agreed requirement that reference levels reflect policies in place up to 2009. The ERT noted that the reporting on the methodology and the projection values in the NC6 was not transparent. During the review, upon request from the ERT, Canada provided ample further information on the methodology of this approach. The main difference between the calculation of the FLRFL emission reference level and the projection of future FLRFL emission levels is that the former makes the assumption that future business as usual harvests will be the same as the recent (1990–2009) average historical average rate, while the latter uses harvesting projections provided by provinces that reflect the most recent understanding of the effect of economic and other factors on harvesting rates.

80. In addition, in determining the FLRFL accounting contribution, Canada uses a production approach instead of an instant oxidation approach for emissions from harvested wood products. Estimates for the production approach are shown in the national inventory reports and are included in developing the projections for comparison to the reference level. The ERT acknowledges that there is no precedent on best practices for reporting on this issue and commends Canada for its ground-breaking approach in this matter. However, the

ERT encourages Canada to improve the transparency of the reporting on its reference level approach by including all relevant information and values in a single format, enabling a clear understanding of the relationship between actual emissions and removals, emission projections and reference level values.

81. FLRFL emission projections, however, were also reported to exclude the impacts of natural disturbances such as wildfires and pest infestations. The ERT noted that this is an approach that could underestimate emission projections of this category.

82. Canada reported on the changes to the methodology compared to the NC5 and provided supporting documentation in an annex to the projections section in the NC6. The changes to the methodology concerned updating the time horizon from 2012 to 2030 and improvements in methodology in the electricity, oil and gas, transport and industry sectors. In addition, the data used for calibrating the model were updated. For LULUCF, the modelling approach shifted towards consistency with Canada's inventory reporting under the Convention. Given the fact that projections in the NC5 only ran to 2012, no estimation of the impact of the changes in methodology could be made. However, as Canada informed the ERT during the review, Environment Canada produces reports of GHG emission projections on a regular basis that include the most recent information and will allow inter-annual comparison of the results. The ERT commends Canada for this effort and encourages it to report on changes in methodology in its next submission, as well as on observed changes in results of consecutive outlooks.

83. During the review, the ERT was also informed on planned improvements to the E3MC model, which would include details on the oil and gas production sector and pricing, time-dependent patterns for electricity supply and demand, biofuel production details, refinery and oil sand operations on a site-by-site basis, and alternative approaches to a 'without measures' scenario. The ERT commends Canada for this effort to improve its modelling capacity and encourages it to report on progress made, as well as on the implications of the projection methodology and results in its next submission.

84. The key assumptions used for the scenarios are described in the NC6. These include assumptions on available energy prices, macroeconomic developments and population trends. Assumptions are updated, taking into account recent economic developments and are provided by different agencies, such as the United States Energy Information Administration, Finance Canada and the National Energy Board. All major assumptions are described in the NC6, including the relationship with historic data, provided by, among others, Statistics Canada. The ERT noted some room for improvement in reporting as the values presented differed in time coverage between the tables (mostly annual growth values) and the text (mostly periodic growth values). The ERT encourages Canada to improve the consistency in its reporting of the assumptions used in its projection scenarios.

85. Unlike in its NC5, Canada included a sensitivity analysis in its NC6. The main parameters that were varied were economic growth and fuel prices. For these variables, combination scenarios with high/low values compared to those from the 'with measures' scenario were calculated and the results presented in the NC6. The ERT commends Canada for doing so and for its reporting on them. The ERT encourages Canada to explore further possible variables that could have an impact on the projections and to report in its next submission on any analysis made.

2. Results of projections

86. Canada adopted a target associated with the Copenhagen Accord, consisting of a reduction of 17.0 per cent of all GHG emissions excluding LULUCF by 2020 compared to the 2005 level. All GHGs are included in the target. This target is equivalent to an emission level of 611,000 kt CO_2 eq by 2020, or 125,000 kt CO_2 eq below the 2005 level. In 2012,

total GHG emissions were 699,000 kt CO_2 eq, or 14.4 per cent above the target, but 5.1 per cent lower than the 2005 level.

87. The 'with measures' scenario shows a continuous increase of emissions, mainly driven by emission increases in the transport sector and the oil and gas sector. By 2020, GHG emissions are projected to reach a level of 762,000 kt CO_2 eq, or 25,000 kt CO_2 eq (3.6 per cent) above the base year of 2005 and 151,000 kt CO_2 eq (24.7 per cent) above the target. The projections indicate that Canada is unlikely to meet its target (17.0 per cent reduction) without putting further PaMs into place or/and without the use of units from LULUCF and from the market-based mechanisms.

88. CO_2 remains the most important contributor to the emissions and emission trend, with a share of about 80.5 per cent; CH_4, although decreasing over time, remains second, with a 11.0 per cent share, and N_2O follows with a 6.5 per cent share. Emissions from fluorinated gases increase the most (150.0 per cent over the 2005–2020 period), but do not reach a share higher than 2.0 per cent of the total GHG emissions.

89. It should be noted that Canada has opted to report according to its own classification of emissions sectors, based on their economic coherence (see para. 67 above). As noted in paragraph 87 above, emissions from the oil and gas sector are expected to increase the most (22.8 per cent compared to 2005), even surpassing those of the transport sector as the largest emitter (26.1 versus 23.1 per cent shares in 2020 GHG emissions, compared to 22.0 and 22.7 per cent shares in 2005). GHG emissions from the electricity sector have decreased further, influenced by a further decarbonization of the energy production mix, reaching a 67.8 per cent level compared to 2005; also, the share in GHG emissions has decreased from 16.4 per cent in 2005 to 10.8 per cent in 2020. The buildings sector, however, sees its emissions increase by 14.5 per cent over the same period, although its share remains fairly constant at 12.5 per cent. Industry and agriculture undergo a modest growth (2.3 and 1.5 per cent in 2020, respectively), with fairly constant shares of about 11.8 and 9.1 per cent, respectively. Finally, the waste sector grows somewhat more, 4.2 per cent by 2020, having a fairly steady share of 6.6 per cent.

90. Canada also reported on a 'without measures' scenario, excluding all measures taken after 2005. While the 'with measures' scenario presented results up to 2030, the 'without measures' scenario only covered 2005–2020. This 'without measures' scenario results in an emission level of 861,000 kt CO_2 eq, which is 17.0 per cent above the 2005 level or 40.9 per cent above the target. The largest differences in emissions compared to the 'with measures' scenario can be found in the electricity sector (+36,000 kt CO_2 eq partially due to the absence of coal-fired power related measures), the transport sector (+17,000 kt CO_2 eq, partially due to the absence of vehicle standards), the building sector (+13,000 kt CO_2 eq, partially due to the absence of buildings and appliance standards), the waste and others sector (+13,000 kt CO_2 eq, partially due to the absence of liquefied fuel gas regulations) and the industry sector (+10,000 kt CO_2 eq, due to the absence of performance regulations), totalling a difference of 100,000 kt CO_2 eq. CO_2 accounts for 87,000 kt of difference and CH_4 for another 10,000 kt CO_2 eq of difference, in line with the absence of sectoral measures. The ERT encourages Canada to report on examples where emission reductions are achieved through behaviour of customers and businesses in its next national communication.

91. Canada also included an economic and oil and gas price sensitivity analysis towards 2020, resulting in a range of achievable emission levels of 686,000–773,000 kt CO_2 eq, thus ranging between −10.0 and +1.4 per cent of the 2020 'with measures' scenario value, which is −6.9 to +4.9 per cent compared to the 2005 level or +12.3 to +26.5 per cent compared to the 2020 target level.

92. Based on information provided by Canada in its NC6 and during the review on the intended use of the contribution of LULUCF, the ERT created an additional scenario taking into account these contributions on top of the 'with measures' scenario. This was straightforward as no overlap exists between the measures included in the 'with measures' scenario and the methodology for estimating the LULUCF contribution. Including these contributions leads to an emission level close to the 2005 level (0.2 per cent below it), but still 20.1 per cent above the 2020 target. The projected emission levels under different scenarios and information on quantified economy-wide emission reduction target are presented in table 5 and the figure.

Table 5
Summary of greenhouse gas emission projections for Canada

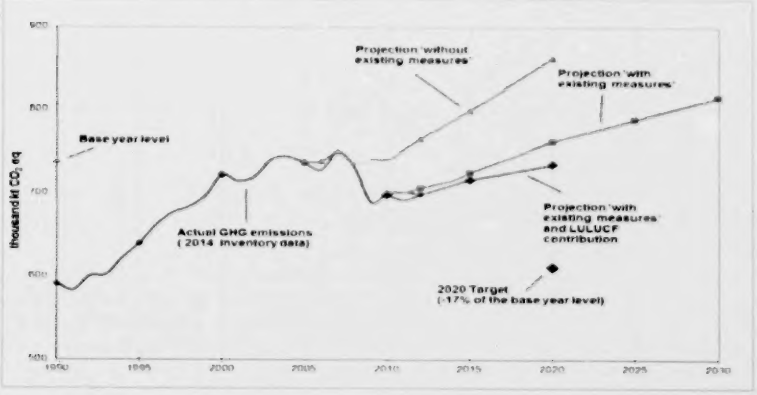
	Greenhouse gas emissions (kt CO_2 eq per year)	*Changes in relation to the 2005 level (%)*
Inventory data 2005, base year for the quantified economy-wide emission reduction target under the Convention[a]	736 000	NA
Quantified economy-wide emission reduction target under the Convention[b]	611 000	−17.0
Inventory data 1990[a]	591 000	−19.7
Inventory data 2012[a]	699 000	−14.4
'Without measures' projections for 2020[b]	861 000	17.0
'With measures' projections for 2020[b]	762 000	3.6
'With measures' projections including contribution from LULUCF for 2020[b]	734 000	−0.2
'Without measures' projections for 2030[b]	NE	NE
'With measures' projections for 2030[b]	810 000	10.1
'With additional measures' projections including contributions from LULUCF for 2030[b]	NE	NE

Abbreviations: LULUCF = land use, land-use change and forestry, NA = not applicable, NE = not estimated.

[a] Canada's 2014 greenhouse gas inventory submission; the emissions are without LULUCF. For reasons of consistency with the reported projection data, inventory data are rounded to thousand kilotonnes.

[b] Canada's sixth national communication and/or first biennial report.

Greenhouse gas emission projections



Sources: (1) Data for the years 1990–2012: Canada's 2014 greenhouse gas inventory submission; the emissions are without land use, land-use change and forestry. (2) Data for the years 2010–2030: Canada's sixth national communication and/or first biennial report; the emissions were without land use, land-use change and forestry; details on the projections were provided by Canada during the review.

Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.

3. Total effect of policies and measures

93. In the NC6, Canada presents the estimated and expected total effects of implemented and adopted PaMs and an estimate of the total effect of its PaMs, in accordance with the 'with measures' scenario definition, compared with a situation without such PaMs as calculated in the 'without measures' scenario. On the request of the ERT during the review, information was presented in terms of total GHG emissions avoided or sequestered; in 2005, 2010, 2011, 2015 and 2020. Canada did not report in its NC6 on the total effect of PaMs on a gas-by-gas basis, but this information was provided during the review. The ERT recommends that Canada adhere to the UNFCCC reporting guidelines on NCs and include in its reporting the total effect of PaMs on a gas-by-gas basis in its next submission.

94. Canada reported that the total estimated effect of adopted and implemented PaMs is an emission reduction of 100,000 kt CO_2 eq. According to the information reported in the NC6, PaMs implemented in the electricity sector will deliver the largest emission reductions, followed by the effect of PaMs implemented in the transport and buildings sectors. The most effective PaMs and drivers behind GHG emission reductions are described in chapter II.B above. Table 6 provides an overview of the total effect of PaMs as reported by Canada.

Table 6

Projected effects of planned, implemented and adopted policies and measures in 2020 and 2030

Sector	*Effect of implemented and adopted measures (kt CO_2 eq)*	*Relative value (% of 2005 emissions)*	*Effect of planned measures (kt CO_2 eq)*	*Relative value (% of 2005 emissions)*	*Effect of implemented and adopted measures (kt CO_2 eq)*	*Relative value (% of 2005 emissions)*	*Effect of planned measures (kt CO_2 eq)*	*Relative value (% of 2005 emissions)*
	2020				*2030*			
Electricity	36 000	29.8	NE	NE	NE	NE	NE	NE
Transport	17 000	10.2	NE	NE	NE	NE	NE	NE
Oil and gas	9 000	5.6	NE	NE	NE	NE	NE	NE
Emission-intensive and trade-exposed industries	10 000	11.4	NE	NE	NE	NE	NE	NE
Building	13 000	15.5	NE	NE	NE	NE	NE	NE
Agriculture	1 000	1.5	NE	NE	NE	NE	NE	NE
Land-use change and forestry	NE	NE	NE	NE	NE	NE	NE	NE
Waste and others	13 000	27.1	NE	NE	NE	NE	NE	NE
Total	**100 000**	**13.4**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**

Source: Canada's sixth national communication and information provided during the review.

Note: The total effect of implemented and adopted policies and measures is defined as the difference between the 'without measures' and 'with measures' scenarios. This includes the impact of government measures combined with the actions of consumers and businesses over the period. Numbers may not add up to the total due to rounding effects. Numbers also may not be consistent with the sum of emission reductions from federal, provincial and territorial measures in the policies and measures listed in CTF table 3, given the interactive effects that may occur between different federal and provincial measures.

Abbreviation: NE = not estimated.

D. Provision of financial resources and technology transfer to developing country Parties

1. Financial resources, including "new and additional" resources

95. In its NC6, Canada provided information on provision of support required under the Convention. The NC6 describes Canada's assistance to vulnerable developing countries, in particular, support for adaptation in the poorest and most vulnerable countries (e.g. through the Least Developed Countries Fund, the World Meteorological Organization (WMO) Global Framework for Climate Services and the World Food Programme activities in Ethiopia). In the NC6, priority countries and regions are identified, notably sub-Saharan Africa, Latin America/Caribbean and South Asia, responding to priorities identified by bilateral partners. A similar distribution of priority countries and regions is shown in the NC5. Priority areas identified in the NC6 are adaptation by the poorest and most vulnerable, clean energy, and forests and agriculture, which are the same priority areas identified in the NC5.

96. Canada provides examples of how its climate finance helps mobilize public and private sector investment in developing countries, for example, through the International Finance Corporation (IFC) with over CAD 276 million available for the promotion of private sector financing for clean energy projects, through the use of concessional funds to catalyse investments in renewable, low-carbon technologies.

97. There is a clean energy focus regarding the mobilization of private financial flows. Canada reports that as of September 2013, out of the CAD 684 million provided to multilateral financial institutions, direct project investments using approximately CAD 110 million have helped mobilize over CAD 1,050 billion of public and private sector investment.

98. Canada is also partnering with multilateral organizations to finance projects that catalyse private sector investments in climate change adaptation, for example, through the climate change fund at the Inter-American Development Bank (e.g. CAD 250 million to co-finance climate-friendly private sector projects in Latin America and the Caribbean, including support for adaptation projects).

99. In its NC6, Canada provides details on measures taken to give effect to its commitments under Article 4, paragraphs 3, 4 and 5, of the Convention as required by the UNFCCC reporting guidelines on NCs. Canada has indicated what "new and additional" financial resources it has provided pursuant to Article 4, paragraph 3, of the Convention and clarified how it has determined such resources as being "new and additional". Canada reports that all of its fast-start finance is completely "new and additional" to planned levels of climate finance prior to the Copenhagen Accord.

100. Canada has reported information on the assistance it has provided to developing country Parties that are particularly vulnerable to the adverse effects of climate change to help them meet the costs of adaptation to those adverse effects. Furthermore, Canada has provided information on financial resources related to the implementation of the Convention provided through bilateral, regional and other multilateral channels, including the Global Environment Facility, a number of development banks, the World Food Programme, the United Nations Development Programme, the United Nations Environment Programme, WMO and many others.

101. With regard to the most recent financial contributions (fast-start finance) to enhance the implementation of the Convention by developing countries, Canada committed itself to provide a total of 1.2 CAD billion delivered over the fiscal years 2010–2011, 2011–2012

and 2012–2013.[5] Canada provided the relevant tables in its NC6 presenting financial support provided in 2009–2010, 2010–2011, 2011–2012 and 2012–2013, with a total of over CAD 1.54 billion over the last three years to support climate change projects through a variety of channels and programmes. Of this total, CAD 1.2 billion is the above-mentioned fast-start finance, together with over CAD 340 million in international assistance projects with direct or significant focus on climate change. Canada's fast-start finance was a considerable scale-up from previous levels, representing an increase of around 300 per cent. All funding reported by Canada is classified as "provided".

102. The NC6 does not include information required by the UNFCCC reporting guidelines on NCs on success (or failure) stories relating to technology transfer (using table 6 from the reporting guidelines), and although table 5 from the reporting guidelines is provided (see NC6, table 7.3), the format is not strictly followed and hence some elements are missing from the table, making it unclear whether the funding for agriculture and forestry is for adaptation or mitigation.

103. During the review, Canada clarified that in table 7.3 of the NC6, the funding for agriculture was for adaptation and the funding for forestry was for mitigation. The ERT encourages Canada to more closely adhere to the format of the reporting tables to improve the transparency of its reporting on finance for mitigation and adaptation.

104. Canada also provided additional information during the review, highlighting some particular projects. Examples include supporting community disaster risk reduction at the Caribbean Development Bank with CAD 14.5 million to support community resilience in the face of natural disasters by undertaking demonstration projects that help determine which prevention or mitigation measures are most effective; support, through the Asian Development Bank (CAD 20 million) to bring large-scale geothermal power to Indonesia; and improving food security through climate-smart agriculture in Burkina Faso where part of the CAD 23.2 million Canada Fund for African Climate Resilience is implemented in partnership with civil organizations.

105. The ERT encourages Canada to include relevant additional material in its next NC or biennial report that may not fit within the required format, but that nevertheless could help provide a more complete picture of Canada's efforts regarding climate finance, technology transfer and capacity-building. Table 7 summarizes information on financial resources.

2. Technology transfer

106. Canada has provided in its NC6 comprehensive and well-organized information on activities related to the transfer of technology and notable activities by the public and private sectors. A detailed review of reported information is provided in chapter II.D.3 of the report of the technical review of the BR1.

107. Canada is committed to a broad range of actions to advance clean technologies globally, including support for domestic research and development, science and technology cooperation with international partners, and capacity-building in developing countries. Examples of this commitment include: support to the UNFCCC Climate Technology Centre and Network (CTCN) (Canada has a seat on the CTCN Advisory Board) and Canada's range of activities aimed at increasing the deployment of carbon capture and storage (CCS). With the CTCN, one of Canada's key areas of focus is to facilitate private sector engagement, given its important role in the technology transfer process. The ERT notes that a portion of Canada's fast-start finance is also focused on the development and deployment of clean energy technologies.

[5] Canada's financial year extends from 1 April to 31 March.

Table 7
Summary of information on financial resources for 2010–2013
(Millions of United States dollars)

Allocation channel of public financial support	*Years of disbursement*			
	2009	*2010*	*2011*	*2012*
Climate-specific contributions through multilateral channels, including				
Contributions to the Global Environment Facility	38.73	60.35	54.15	56.67
UNFCCC Trust Fund for Supplementary Activities		1.03	0.64	0.99
Other multilateral climate change funds	6.28	20.60	0.59	2.26
Contributions through United Nations bodies including				
United Nations Development Programme				18.79
United Nations Environment Programme				15.36
Other	43.93	57.22	40.09	12.50
Multilateral financial institutions, including regional development banks	17.12	381.24	331.35	293.93
Climate-specific contributions through bilateral, regional and other channels	33.09	62.96	72.35	94.59

Source: Data for 2009 and 2010 are those calculated by the expert review team based on the data provided in the sixth national communication and first biennial report. Data for 2011 and 2012: common tabular format tables 7 and 7(a).

Note: For reporting, Canada used fiscal years: the 2009 column covers fiscal year period 1 April 2009 to 31 March 2010, the 2010 column covers fiscal year period 1 April 2010 to 31 March 2011, the 2011 column covers fiscal year period 1 April 2011 to 30 March 2012, and the 2012 column covers fiscal year period 1 April 2012 to 31 March 2013.

108. The NC6 does not include information required by the UNFCCC reporting guidelines on NCs on steps taken to support development and enhancement of endogenous capacities and technologies of developing countries. During the review, in response to the request of the ERT, Canada provided some examples of capacity-building and technology transfer. However, there was no explicit link to support for developing countries to develop or enhance their own technologies. The ERT recommends that Canada include information in its next NC on how it supports endogenous capacities of developing country Parties, with a focus on technology transfer and capacity-building, which supports development of technologies stemming from the developing countries themselves.

109. The ERT noted that table 6 from the UNFCCC reporting guidelines on NCs (for reporting success stories) was not used by Canada. The ERT notes that the NC6 provides descriptions of several successful projects, and during the review, Canada provided additional information elaborating on key developments since the BR1/NC6 and the lessons learned to date from its reporting on transfer of technology. One example is Canada's leading role through the International Development Research Center, where it provided close to CAD 1 million in 2014 to the Climate Technology Initiative's Private Financing Advisory Network for supporting adaptation research globally and connecting adaptation-related projects with private financing, noting that this is an ongoing project. The ERT recommends that in its next NC, where feasible, Canada reports success stories on the provision of technological support in the tabular format provided in the UNFCCC reporting guidelines on NCs.

110. Canada also highlighted achievements in its key areas including modelling and software tools relating to a standardized methodology tool to assess engineering

vulnerability of infrastructure in a changing climate (applied in infrastructure risk assessments in Costa Rica and Honduras), wide deployment of the clean energy decision-making software RETScreen and the carbon budget model forest carbon accounting software that Canada provides free of charge and which is used in a number of developing countries including China, Mexico and Republic of Korea. Canada also highlighted its role as a global leader in the research, development and demonstration of CCS technologies with four large-scale demonstration projects in operation or under construction.

E. Vulnerability assessment, climate change impacts and adaptation measures

111. In its NC6, Canada has provided the required information on the expected impacts of climate change in the country and on adaptation options.

112. During the review, Canada provided additional information on its changing climate. Canada has become warmer (by 1.5 degrees Celsius between 1950 and 2010), and the annual number of extreme warm days has increased, while extreme cold days have declined. The seasons have become wetter, with much regional variation, and the response from the cryosphere is a dramatic decline in sea ice, less snowfall and snow cover, and glaciers that are shrinking.

113. The ERT was made aware of the impacts happening now in different sectors. In the environment sector, these impacts include earlier flowering of plants, northward shifts of species, declines in bird population and increased mortality rates in salmon. In the economic sector, impacts include the mountain pine beetle outbreak in western Canada, permafrost thaw on infrastructure and shorter winter road seasons. In the health sector, impacts include longer ragweed seasons, the spreading of Lyme disease vectors and more extreme heat events. There is demonstrated vulnerability to extreme events across the country, with concerns for all sectors.

114. The ERT was informed of Canada's federal adaptation policy framework that guides domestic action along with its renewed and expanded focus on its ongoing commitment to climate change adaptation. The ERT was also informed that: adaptation has been incorporated into more strategies and plans at the provincial and territorial levels; municipalities have taken action to prepare for a changing climate; and progress at all levels has been encouraged by new mechanisms developed to facilitate collaboration, shared learning and priority setting on adaptation research and action. As part of its activities, Canada has allocated nearly CAD 150 million over five years (2011–2016) in 10 adaptation programmes to improve the understanding of climate change and help Canadians prepare for climate-related impacts. The funding is disbursed over nine departments and agencies, with a detailed quantification of the amount given to each programme.

115. The ERT was provided with additional examples of adaptation that include overdesigning drainage culverts to allow for increased frequency and intensity of rain events, adjusting start times for tapping sugar maple trees and adjusting insurance coverage to better align with the exposure to climate risk (e.g. flooding). The ERT was advised of the challenges in taking adaptation measures in coastal zone management and informed of policy guidance to mainstream adaptation into coastal zone management.

116. In preparing for adaptation, the ERT was provided with evidence of cooperation between provinces and territories where efforts are focused mainly on funding regionally focused climate change adaptation studies. Territories have released stand-alone adaptation strategies that tend to highlight the importance of climate science to inform decision makers and the need for collaboration, given the scope of the challenges. Municipalities are actively involved in emergency management and recognize weather-related hazards as

important considerations when evaluating risks and preparing plans. International efforts include partnering with a number of countries in several forums, in particular, the Arctic Council, with a focus on the exchange of information relevant to facilitating adaptation in the northern region. Canada is actively engaged in the international community through strengthening the dissemination of research and science related to the impacts of climate change to ensure that adaptation actions are informed by the best available knowledge.

117. In June 2014, the Government of Canada released a publication *Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation*, which entailed synthesizing over 1,500 publications into a single definitive resource providing a picture of what climate change means for Canada across sectors.

118. The ERT was told that adaptation can turn risks into opportunities and was given examples. Adaptive management could allow hydroelectric producers in northern Quebec to capitalize on increased flows associated with climate change, and as an example, hydroelectric energy generation could increase by up to 15 per cent by 2040–2069 at the Chute-des-Passes power plant. However, if the current management practices remain unchanged, hydroelectric energy generation could decrease by up to 14 per cent. In addition, by adopting crop selections and timing, agricultural producers can take advantage of higher summer temperatures and the ability to grow crops further north. Table 8 summarizes the information on vulnerability and adaptation to climate change presented in the NC6.

Table 8
Summary of information on vulnerability and adaptation to climate change

Vulnerable area	*Examples comments adaptation measures reported*
Agriculture and food security	*Vulnerability*: decreased water availability, impaired livestock health; decreased food production, increased insect infestations *Adaptation*: crop insurance programmes, promotion of best management practices to reduce vulnerability to extreme climate events; adjustment of start times for tapping sugar maple trees; adaptation of crop selections and timing
Biodiversity and natural ecosystems	*Vulnerability*: droughts; floods; impact on wild life *Adaptation*: extending systems of parks and protected areas; mapping and developing ecological inventories; monitoring national parks
Coastal zones	*Vulnerability*: coastal inundation; increased storm surge flooding and shoreline erosion; coastal infrastructure becoming increasingly exposed; loss of cultural resources; contamination of wild life and marine resources *Adaptation*: no adaptation measures reported, however, Natural Resources Canada has stated that in addition to this report (sixth national communication), sectoral assessments focused on marine coasts, transportation and mining will be completed by 2016
Drought	*Vulnerability*: increase in frequency of forest fires *Adaptation*: urban forest management plan (2012); forest fire management
Fisheries	*Vulnerability*: changing fish distribution affecting country food supplies *Adaptation*: no adaptation measures reported, however, Fisheries and Oceans Canada is developing new scientific knowledge to support development of adaptation tools and strategies that will enable integration of climate change considerations into delivery of programmes and policies
Forests	*Vulnerability*: more frequent droughts; more frequent and intense forest fires; increased insect infestations *Adaptation*: forest fire management/urban forest management plan (2012); tourism action plan to combat effects of mountain pine beetle

Vulnerable area	*Examples comments adaptation measures reported*
Human health	*Vulnerability*: heat-related stress on elderly, adverse impacts on rural areas *Adaptation*: expanding heat alert and response systems programme, disseminating heat- and health-related guidelines and information, supporting development of health adaptation plans and information tools
Infrastructure and economy	*Vulnerability*: melting and thawing of snow affecting structure of settlements in the Arctic region, introduction of heat stress, wild life disturbed *Adaptation*: improved building codes and standards, emergency management and disaster planning, building knowledge on how to deal with problems
Water resources	*Vulnerability*: increased winter flows expected in many regions, resulting in floods offset by decreased summer flows, resulting in reduced water quality *Adaptation*: effective water resources management
Transportation	*Vulnerability*: decreased quality of northern ice roads, increased cost of maintaining and operating transportation, increased evaporation contributing to lower levels in the Great Lakes, which affects shipping *Adaptation*: reinforcement of public infrastructure

F. Research and systematic observation

119. Canada has provided information on its actions relating to research and systematic observation, and addressed both domestic and international activities, including the Global Climate Observing System (GCOS) and the IPCC. The NC6 also reflects actions taken to support related capacity-building in developing countries. Furthermore, Canada has provided a summary of information on GCOS activities.

120. The NC6 does not include information on paleoclimate studies, with regard to general policy on and funding of research and systematic observations. The NC6 also does not identify the opportunities for and barriers to free and open international exchange of data and information and does not report on action taken to overcome barriers. During the review, Canada provided relevant additional information. The ERT encourages Canada to provide relevant information in its next NC.

121. During the review, Canada informed the ERT that there is no broad, countrywide policy in place regarding general policy on and funding of research and systematic observations. Research and systematic observations in Canada are supported through a variety of different funding policies and programmes across various levels of government and within academia. The ERT was informed that Canada adheres to WMO resolution 40 on the free exchange of data, but applies cost recovery for value added information provided to users. Barriers to the exchange are mainly information technology infrastructure limitations. Canada also provided additional information elaborating on its International Data Rescue Program and progress made using combined regional-scale atmospheric and space-based observations with inverse modelling approaches to verify GHG emissions reporting.

122. The ERT was made aware of: a new website design geared to three groups of users – basic, intermediate and power; new tools and indices that have been developed for drought monitoring; and the implementation of a new data management system to improve the life cycle management of operational weather, climate and hydrometric observations.

123. The ERT was appraised of the development initiatives in research and systematic observations. Some of these initiatives include: the ongoing modernization of existing networks and initiation of "networks of networks", with a view to improving access to and exchange of all weather, climate and hydrometric data; expansion of networks to enhance

regional coverage in northern and western areas; and development of a suite of new climate change scenarios in combination with international models.

124. The ERT noted that Canada collaborates at the federal/provincial/territorial levels to establish climate change indicators, to obtain sector-relevant climate information and to establish a national hydrometric programme. There is also collaboration with academia (e.g. University of Victoria, University of Toronto and University of Quebec at Montreal) to undertake climate modelling research. Standards associations and professional organizations utilize climate information for a national building code. Canada collaborates with international governments, national climate agencies and research institutes such as the National Oceanic and Atmospheric Administration (United States), the Meteorological Administration (China), the Met Office (United Kingdom of Great Britain and Northern Ireland) and the Alfred Wegener Institute (Germany).

125. Canada also provides capacity-building in developing countries in the research and systematic observation area. This includes support to China by way of arrangements with the China Meteorological Administration to focus on climate change and agriculture, water resources, biodiversity, disaster risk reduction and renewable energy. In Africa, Canada provided support through its participation in a climate modelling experiment under the World Climate Research Programme and by providing regional climate information that could be used for adaptation and impact studies. Canada aligned itself with the Inter-American Institute for Global Change to build adaptive capacity in the Americas. In 2013, Canada signed an agreement with WMO to finance a programme for implementing the global framework for climate services at regional and national scales to the amount of CAD 6.14 million over four years to enhance capacities and mechanisms for climate services in the Caribbean and South Western Pacific.

126. Canada participates in global climate observing systems, and plans are under way for a full review of the contributions to GCOS (2015–2016) and the development of an implementation plan for the WMO Integrated Global Observing System in 2015.

G. Education, training and public awareness

127. In the NC6, Canada has provided information on its actions relating to education, training and public awareness at both the domestic and international levels. Compared to the NC5, Canada provided more extensive information on primary, secondary and post-secondary education. During the review, the ERT was informed that climate change is taught across a range of subjects and degrees, but it is traditionally part of senior science and geography studies. The post-secondary education environmental programmes are prominent in universities with climate science curriculums.

128. There is no established practice in Canada for public or non-governmental organization participation in climate change related decision-making. The ERT was informed that much has already been achieved through provincial initiatives, and that all levels of government and a number of non-governmental organizations have undertaken a range of activities to broaden public awareness of climate change. Canada is encouraged to provide this information in its next NC.

129. During the review, Canada provided additional information elaborating on public access to information, networks of centres of excellence and research granting agencies, and resource and information centres. Canada also provided information on partnerships that focus on empowering consumers and businesses through information to make informed choices to pursue energy efficiency. Free access to information by the public is through portals (websites and social media) to obtain information about climate change, government programmes, reports and initiatives. Conferences and trade shows are also used to highlight

climate change initiatives and promote national and international events that include Americana, GLOBE and the Global Methane Initiative Expo.

130. Federal government departments, provincial and municipal governments, and non-governmental organizations act as climate change resource or information centres for local governments and businesses (e.g. Natural Resources Canada partners with a variety of stakeholders to promote energy efficiency).

131. Training is provided when students are hired through cooperative education and other programmes for hands-on learning about environmental policy. Training is also achieved through networks of centres of excellence that combine academia, industry, government and non-profit organizations. Three federal granting councils, the Natural Sciences of Health Research Council, the Canadian Institutes of Health Research and the Social Sciences and Humanities Research Council, assist with supporting training. There is full engagement with provincial and territorial partners.

III. Conclusions and recommendations

132. The ERT conducted a technical review of the information reported in the NC6 of Canada according to the UNFCCC reporting guidelines on NCs. The ERT concludes that the NC6 provides a good overview of the national climate policy of Canada. During the review, Canada provided additional information pertaining to: approaches being used to plan for additional PaMs; how the federal government, provinces and territories coordinate and collaborate on PaMs; the projected benefits of implemented PaMs; more details on the projected emissions by sector and by gas for both the 'with measures' and the 'without measures' scenarios; its reference level approach for FLREL; success stories relating to technology transfer; its research policies and programmes; and public access to climate change information.

133. Canada's emissions for 2012 were estimated to be 18.2 per cent above its 1990 level excluding LULUCF and 42.2 per cent above including LULUCF. The large change when LULUCF is included reflects the fact that uncontrollable large forest natural disturbances (wildfires and insect infestations) have converted the sector to being a large source in most years since 2002, whereas in 1990, LULUCF was a sink because of a relatively low number of natural disturbances. Emission increases outside of LULUCF were driven by economic and population growth, with the increases dominated by the oil and gas sector. These factors by far outweighed improvements in the efficiency of energy supply and use.

134. Canada provided comprehensive information on PaMs at the national and subnational levels. Canada's current sector-by-sector regulatory approach has, to date, targeted the transport and electricity sectors, which are two of the highest emitting sectors in Canada, and federal coordination with provinces and territories is critical in addressing the reduction of GHG emissions. In the energy sector, federal regulations have been introduced for coal-fired power plants, and in the transport sector, Canada is pursuing regulatory approaches for the reduction of GHG emissions via: fuel-efficiency standards for light- and heavy-duty on-road vehicles; renewable fuels standards; and global mitigation measures developed by the International Maritime Organization and International Civil Aviation Organization for maritime transportation and aviation, respectively.

135. In the NC6, Canada presents GHG projections for the period from 2012 to 2030. Two scenarios are included: a 'with measures' and a 'without measures' scenario until 2030 and 2020, respectively, presented relative to actual inventory data for 1990 to 2011. The projected changes in GHG emissions relative to 2005 under the 'without measures' and 'with measures' scenarios are 17.0 and 3.6 per cent, respectively. The projections indicate that Canada is unlikely to meet its target (17.0 per cent reduction) without putting further

measures into place or/and without the use of units from LULUCF and from the market-based mechanisms.

136. Comprehensive information is provided by Canada on the provision of financial, technological and capacity-building support. Canada's fast-start finance was a considerable scale-up from previous levels, representing an increase of around 300 per cent to a total of over CAD 1.54 billion to support climate change projects through a variety of channels and programmes. Canada is involved in a broad range of actions to advance clean technologies globally, including support for domestic research and development, science and technology cooperation with international partners, and capacity-building in developing countries.

137. Canada has provided the required information on the expected impacts of climate change within the country and on adaptation options. Canada has a federal adaptation policy framework that guides domestic action, and adaptation has been incorporated into strategies and plans at the provincial and territorial levels.

138. Canada reported on its actions relating to research and systematic observation, addressing both domestic and international activities, including the IPCC and GCOS, and provided a summary of its GCOS activities.

139. Canada undertakes a range of actions relating to education, training and public awareness at both domestic and international levels. This includes primary, secondary and post-secondary education, as well as initiatives focused on empowering consumers and businesses through information to make informed choices to pursue energy efficiency.

140. In the course of the review, the ERT formulated several recommendations relating to the completeness and transparency of Canada's reporting under the Convention. The key recommendations[6] are that Canada:

(a) Improve completeness of reporting by including in the next NC the following information:

(i) Textual descriptions of the principal PaMs in the agriculture and waste sectors;

(ii) The total effect of PaMs on a gas-by-gas basis;

(iii) A description of how it supports the endogenous capacities of developing country Parties, with a focus on technology transfer and capacity-building, which supports development of technologies stemming from the developing countries themselves;

(iv) Where feasible, success stories on the provision of technological support in the tabular format provided in the UNFCCC reporting guidelines on NCs;

(b) Improve the transparency of reporting by including in the next NC the following information:

(i) A clear reference to CTF table 3 as a replacement for table 1 of the UNFCCC reporting guidelines on NCs, providing mitigation estimates for historic years and structuring textual descriptions of PaMs by sector;

(ii) Implemented and adopted measures included in the 'with measures' projections.

[6] The recommendations are given in full in the relevant sections of this report.

Annex

Documents and information used during the review

A. Reference documents

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications". FCCC/CP/1999/7. Available at <http://unfccc.int/resource/docs/cop5/07.pdf>.

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories". FCCC/CP/1999/7. Available at <http://unfccc.int/resource/docs/cop5/07.pdf>.

"Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention". Annex to decision 23/CP.19. Available at <http://unfccc.int/resource/docs/2013/cop19/eng/10a02.pdf#page=20>.

FCCC/SBI/2011/INF.1. Compilation and synthesis of fifth national communications. Executive summary. Note by the secretariat. Available at <http://unfccc.int/resource/docs/2011/sbi/eng/inf01.pdf>.

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FCCC/ARR/2013/CAN. Report of the individual review of the inventory submission of Canada submitted in 2013. Available at <http://unfccc.int/resource/docs/2014/arr/can.pdf>.

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2013 GHG inventory submission of Canada. Available at <http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/7383.php>.

2014 GHG inventory submission of Canada. Available at <http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8108.php>.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Lyne Monastesse and Ms. Laura Coates (Department of Environment, Canada), including additional material on updated policies and measures, greenhouse gas projections, provision of financial, technological and capacity-building support and recent climate policy developments in Canada. The following document[1] was also provided by Canada and used by the ERT during the preparation of this report:

Natural Resources Canada. 2014. *Energy Markets Fact Book 2014–2015*. Her Majesty the Queen in Right of Canada, as represented by the Minister of Natural Resources, 2014.

[1] Reproduced as received from the Party.